

Ivy, the 7th typhoon of 1977, originated from an easterly wave. It was first detected by synoptic data moving westward over the Marshall Islands on the 14th of October. Within 24 hours it entered an area of increased low level convergence associated with the near equatorial trough (NET), intensified, and developed a surface circulation. For the next 8 days it remained within the NET before breaking loose.

The development of Ivy was also aided by the movement of Tropical Storm Harriet, which was also embedded in the NET. TS Harriet moved northward through the Philippine Sea displacing the NET northward. This northward shift allowed for an increase in favorable conditions for intensification. By the 19th the developing cyclone (Ivy) was receiving most of the low level, southwesterly flow that was previously supplied to the now weakening Harriet (Fig. 4-17). The next day satellite data indicated that the disturbance's convective activity and organization had increased while surface reports indicated that the central pressures were steadily falling. JTWC, therefore, issued a formation alert at 200126Z.

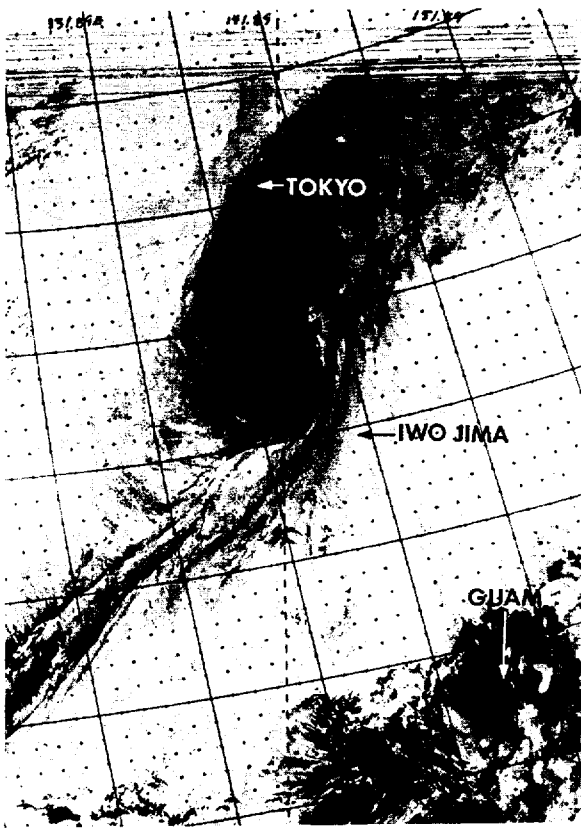


FIGURE 4-17. Infrared photograph of Ivy in the formative stage near Guam with Tropical Storm Harriet at maximum intensity of 55 kt (28 m/sec), 19 October 1977, 1014Z. (DMSP imagery)

Upper tropospheric, synoptic data from the morning of the 21st indicated that the outflow pattern above the alert area was continuing to strengthen. An aerial reconnaissance investigation on the afternoon of the 21st detected an organized surface cyclonic circulation with a 996 mb central pressure. Reconnaissance data further indicated that the disturbance was moving northward just east of the Mariana Islands. Along with supportive satellite data, the first warning on TD 17 was issued at 210600Z.

On the morning of the 20th, TD 17 began moving through a break in the subtropical ridge previously opened by Harriet. This was also an area of weak and variable steering currents. From the morning of the 21st to the evening of the 22nd, there was a lack of any definitive, middle tropospheric steering flow which resulted in the erratic movement of the storm. For 36 hours TD 17 meandered and then looped before heading northeastward (Fig. 4-18).

During the formative stages of TD 17, upper tropospheric, synoptic and satellite data indicated the presence of a weak tropical upper tropospheric trough (TUTT) to the northeast. As the disturbance reached tropical depression intensity, data indicated that a low in the TUTT had developed. The establishment of the TUTT low in this region allowed for an increase in the advection of mass away from the storm. This allowed for further intensification and the depression to reach tropical storm intensity during the course of its loop. Aircraft reconnaissance

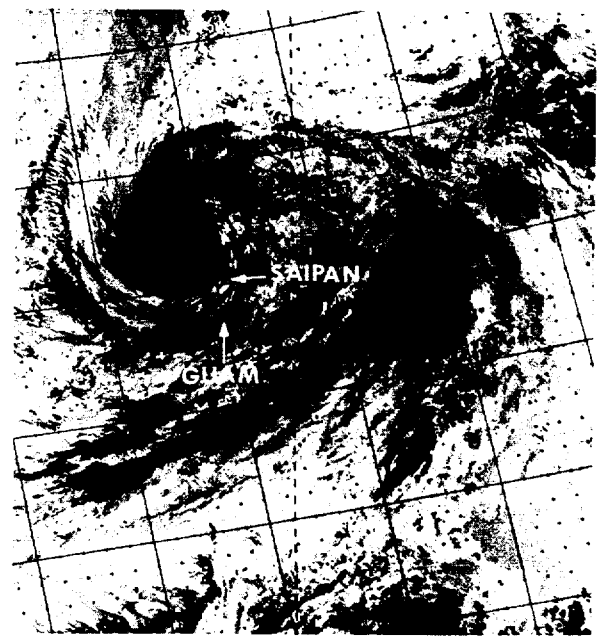


FIGURE 4-18. Infrared photograph of Ivy with 40 kt (21 m/sec) winds executing a cyclonic loop, 22 October 1977, 0923Z. (DMSP imagery)

on the 21st at 1545Z observed a maximum flight level, 700 mb, wind of 38 kt (20 m/sec) associated with the storm. Based on this data TD 17 was upgraded to Tropical Storm Ivy at 211800Z.

From the evening of the 22nd, the storm began to accelerate and move northeastward in response to an eastward moving short-wave trough in the mid-latitude westerlies. During this period the TUTT began to intensify. This created an upper air regime which was favorable for further intensification. On the morning of the 24th Ivy reached typhoon intensity. Reconnaissance aircraft at 0341Z recorded a central pressure of 967 mb and observed sustained, 700 mb winds of 75 kt (39 m/sec) about an eye 30 nm (56 km) in diameter.

After reaching typhoon intensity, Ivy continued to the northeast. This movement caused the storm to pass 20 nm northwest of Marcus Island (WMO 47991) at 241930Z. Marcus reported a sustained 70 kt (36 m/sec) at 1800Z and 111 kt (57 m/sec) gusts at 2100Z. As Ivy continued northeastward, further intensification took place. After establishment of other TUTT lows to the north and south of the storm, a maximum strength of 90 kt (46 m/sec) was reached on the 25th (Fig. 4-19). New aircraft data reported a well defined eye with a 945 mb central pressure.

Typhoon Ivy maintained maximum intensity for 12 hours. The continued northward displacement was due to the increasing influence of a quasi-stationary upper-level trough east of Japan. This also caused the storm to enter a cooler environment which began to degrade Ivy into an extratropical system. As a result, the last warning was issued at 261800Z. Ivy quickly weakened and became extratropical along a cold front.

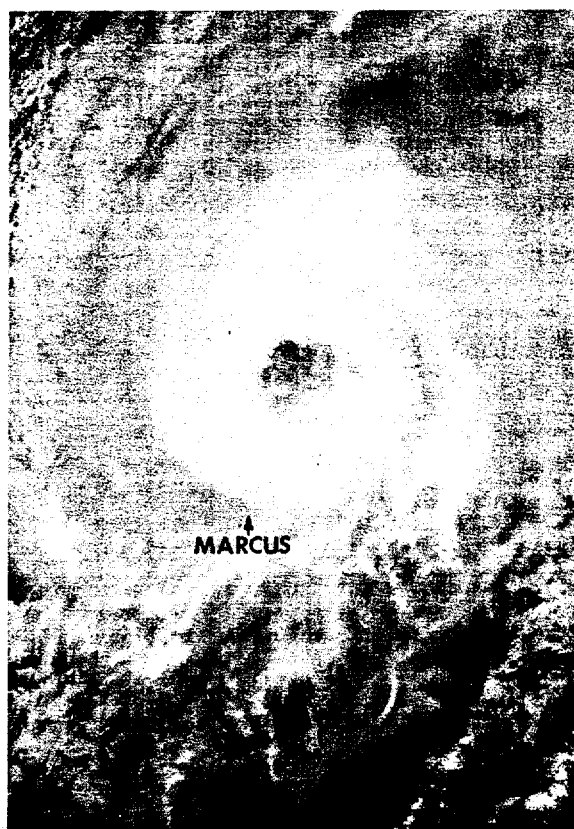


FIGURE 4-19. Typhoon Ivy displaying a well defined eye at its maximum intensity of 90 kt (46 m/sec), 25 October 1977, 0106Z. (DMSP imagery)